

U.S. Patent Application No. 09/833,202  
Amendment dated December 11, 2007  
Response to Office Action of June 12, 2007

### **REMARKS**

Reconsideration and continued examination of the above-identified application are respectfully requested.

#### **Status of Claims**

Claims 2, 9, 11-13, 15, 16, and 29-39 are currently pending. Claims 2, 9, 11-13, 15 and 16 are withdrawn from consideration. Claims 1, 3-8, 10, 14, 17-28 are canceled. New claims 29-39 are introduced. No claims are currently amended.

New claim 29 is supported by claims 17, 19 and 21 of record, and at page 4, lines 7-10, 12-13, page 9, lines 3-17 and page 35, line 4 to page 36, line 4, and elsewhere in the present application.

New claims 30-37 have the same support as indicated for new claim 29 in combination with the recitations of claims 3, 4, 7, 8, 10, 22, 24 and 25 of record, respectively.

New claim 38 has the same support as indicated for new claim 29 in combination with the descriptions in the present specification, *e.g.*, at page 16, lines 10-15, page 22, line 20 to page 23, line 17, and page 31, lines 11-13, and elsewhere in the present application.

New claim 39 has the same support as indicated for new claim 29 in combination with the descriptions in the present specification, *e.g.*, at page 12, line 9 to page 13, line 23, and elsewhere in the present application.

Accordingly, no questions of new matter should arise and entry of this amendment is respectfully requested. In addition, new claims 29-39 are readable on the previously elected group and species identified in the applicant's previous response of March 3, 2003 to a restriction and election of species requirement made by the Examiner.

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**Interview Summary**

This interview summary is responsive to the Examiner's Interview Summary mailed September 13, 2007. The applicant acknowledges with appreciation the courtesy of the personal interview granted by the Examiner to the applicant's representative, Ramon R. Hoch, on September 11, 2007.

The applicant's representative discussed that the combination of the modified carbon product and catalyst (Pt) was effective to improve catalytic efficiency, wettability, flood prevention, reduced binder requirements, mass transport and hydrophobic/hydrophilic properties of the fuel cell or components thereof. The applicant's representative also presented proposed amendments, which were discussed at the time of the interview. The proposed claims included one or more features of a specific catalyst (Pt), active layer thickness, and the catalyst (Pt) particles being attached or adsorbed to the modified carbon product as a product of a reducing of a cationic platinum catalyst complex attached to the modified carbon product. The differences between the cited art and claimed invention were discussed.

**Rejection of Claims 3-7, 17, 19, 22 and 24-28 under 35 U.S.C. §102(e) -- Yu et al.**

At page 3 of the Office Action, the Examiner rejects claims 3-7, 17, 19, and 24-28 under 35 U.S.C. §102(e) as being anticipated by Yu et al. (U.S. Patent No. 6,399,202).

At pages 3-8, the Examiner sets forth substantially the same previous positions regarding Yu et al., as were set forth in previous Office Actions. The Examiner adds additional remarks regarding this rejection that are interspersed among pages 16-20 of the Office Action in response to the applicant's most recent response.

In the newly added remarks at page 16 of the Office Action, the Examiner states that the claim language "*wherein said catalyst particles are attached or absorbed onto the modified*

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*carbon product*” does not exclude a “physical mixture”. At page 18 of the Office Action, the Examiner states that the gist of the applicant’s arguments is premised on the assertion that the prior art of record does not disclose “A modified carbon product having attached at least one organic group that is proton-conducting,” to which the Examiner disagrees. This rejection is respectfully traversed.

Although claim 17 has been canceled in this amendment, new claim 29 includes the recitations of claims 17, 19 and 21 of record, which claims were both included under this rejection based on Yu et al. Newly added claim 29 also includes additional language regarding the catalyst (Pt) particles being attached or adsorbed to the modified carbon product as a product of reducing a cationic platinum catalyst complex attached via ion exchange to the modified carbon product having at least one attached organic group. The applicant provides the following remarks on how present claim 29 is different from, and thus not identically disclosed by, the materials disclosed by Yu et al.

Claim 29 recites a fuel cell that comprises, *inter alia*, an active layer comprising a platinum catalyst attached or adsorbed onto the modified carbon product via reduction of cationic platinum catalyst complex attached via ion exchange to the modified carbon particles having at least one attached organic group (e.g.,  $-\text{C}_6\text{H}_4\text{SO}_3^-$ ). As a result of this claimed interaction, the platinum catalyst is present in very close proximity to the organic groups and thus makes it possible to form an active layer with a catalyst, proton conductor, and electron conductor in extremely close proximity to each other upon reduction of the ion exchanged complex, which permits excellent catalyst utilization (see, e.g., page 9, lines 3-17 and page 35, line 4 to page 36, line 4). Further, the Examples disclosed in the present application show the ability of the present invention to achieve excellent accessible catalyst surface area using a catalyst layer, which is

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formed with a modified carbon product, and having an attached or adsorbed metal catalyst.

With respect to the Examiner's construction of the claim terminology "attached or absorbed", the applicant does not traverse the Examiner's views in this regard at this time, as the applicant believes the present claims can be differentiated from the relied upon cited art, such as Yu et al., based on other reasons identified herein.

Unlike the claimed invention, as recited in claim 29, Yu et al. does not teach an active layer comprising at least one modified carbon product comprising a carbon product having attached at least one organic group that is proton-conducting and platinum catalyst particles, wherein the platinum catalyst particles are attached or adsorbed onto the modified carbon product as presently claimed. In particular, Yu et al. does not teach or suggest an attached or adsorbed platinum catalyst, nor does U.S. Patent No. 5,561,000 (also referred to by the Examiner since Yu et al. makes reference to this patent), in which platinum catalyst particles are attached or adsorbed to a modified carbon product as a product of a reducing of a cationic platinum catalyst complex attached to the modified carbon product via ion exchange. As explained in the present application, and noted above, a unique and improved active layer for a fuel cell is achieved in the presently claimed interaction and arrangement of modified carbon product having at least one organic group and reduced cationic platinum catalyst complex.

Further, the reference in the Office Action to a cobalt-containing material at col. 13, lines 15-20 of Yu et al. is not a teaching of a *platinum* catalyst that is attached or adsorbed onto a modified carbon product having at least one organic group, nor is it a teaching of platinum or other metal catalyst particles which are attached or adsorbed to a modified carbon product *as a product of a reducing of a cationic metal catalyst complex attached via ion exchange to the modified carbon product*. As shown in Example 15 of Yu et al. (col. 13, lines 5-29), a cobalt-

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containing macrocyclic was achieved by heating a carbon-supported material, wherein cobalt porphyrin was mixed with modified carbon product, which would be a physical blend or mixture, and the mixture was then pyrolyzed (900°C for 1 hr.) and finely ground before further processing. The cobalt porphyrin is not a cationic platinum catalyst complex, nor a reduced form thereof. Moreover, cobalt is not platinum. Thus, Yu et al. does not teach claim 29, or the claims dependent on claim 29.

Although Yu et al., at col. 2, lines 19-20, incorporates the disclosures of U.S. Patent No. 5,561,000 by reference, the Yu et al. reference also discloses that the invention described by Yu et al. is an alternative method thereto (see col. 2, line 66 to col. 3, lines 10). With this understanding, it is not surprising that U.S. Patent No. 5,561,000 is nowhere mentioned in the Yu et al. reference other than in the "BACKGROUND OF THE INVENTION" section thereof. Therefore, the arbitrary picking and choosing of disclosures from U.S. Patent No. 5,561,000 for combined use in or for modification of a disclosure of Yu et al.'s disclosed invention, such as done in the Office Action, requires combinations of separate teachings of two different references. Therefore, reliance on U.S. Patent No. 5,561,000 in the rationale of this rejection necessitates an obviousness analysis, and, therefore, there is no anticipation of the present claims based on Yu et al.

Further, U.S. Patent No. 5,561,000 does compensate for the above-noted differences between Yu et al. and the present claims. The particular catalyst layer formed in U.S. Patent No. 5,561,000 is through a combination of carbon powder with platinum metal (Pt) and ionomer as described, for instance, at col. 4, lines 6-16 of U.S. Patent No. 5,561,000. There is no teaching or suggestion of a modified carbon product in U.S. Patent No. 5,561,000, and there is no teaching or suggestion therein of a modified carbon product having attached or adsorbed catalyst particles

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wherein catalyst particles are attached or adsorbed onto the modified carbon product via the interaction of cationic platinum catalyst complex and modified carbon product having at least one attached organic group as presently claimed.

In view of at least the above reasons, Yu et al. does not anticipate newly added claim 29, nor any of its dependent claims 30-39 for at least the same reasons.

Accordingly, this rejection should be withdrawn.

As acknowledged by the Examiner in the Office Action (page 15, section 11), the applicant has overcome a previous rejection under Section 103 based upon Yu et al. and Watakabe et al. by presenting a satisfactory statement of common ownership between Yu et al. and the present invention in the applicant's previous response. In view of the same showings and reasons, the applicant submits that, under 35 U.S.C. §103(c), due to a common assignee, Yu et al. also is not available as prior art under 35 U.S.C. §103(a) against new claims 29-39. It also is submitted that these claims are not taught or suggested by Yu et al.

**Rejection of Claims 17 and 26-28 under 35 U.S.C. §102(e) – Tosco et al.**

At page 5 of the Office Action, the Examiner rejects claims 17 and 26-28 under 35 U.S.C. §102(e) as being anticipated by Tosco et al. (U.S. Patent No. 6,881,511).

In the rejection statement, the Examiner appears to qualify the application of this grounds of rejection as being applicable to "at least" claims 17 and 26-28. However, no claims are separately discussed or otherwise identified under this rejection other than claims 17 and 26-28. The Examiner essentially relies on Tosco et al. in a similar manner as in previous Office Actions with some refinements. The present Office Action further includes references to disclosures at column 1 in the Background of the Invention section of the Tosco et al. references and separately

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refers to Example 15 in particular. The Examiner also makes reference to Examples 12-15 of Tosco et al., as well as other sections of Tosco et al., to reject these particular claims. This rejection is respectfully traversed.

As indicated, new claim 29 recites, *inter alia*, the fuel cell having an active layer comprising platinum catalyst particles which are attached or adsorbed to the modified carbon product as a product of a reducing of a cationic platinum catalyst complex attached via ion exchange to the modified carbon product. Tosco et al. does not disclose that feature.

The Examiner draws special attention to Example 15 of Tosco et al. in the Office Action. The applicant points out that a cobalt-containing material at col. 13, lines 15-37 of Tosco et al. is not a teaching of a *platinum* catalyst that is attached or adsorbed onto a modified carbon product having at least one organic group, nor is it a teaching of platinum or other metal catalyst particles which are attached or adsorbed to a modified carbon product as a product of a reducing of a cationic metal catalyst complex attached via ion exchange to the modified carbon product. As shown in Example 15 of Tosco et al., and similar to the above-discussed Example 15 of Yu et al., a cobalt-containing macrocyclic was achieved by heating a carbon-supported material, wherein cobalt porphyrin was mixed with modified carbon product, which would be a physical blend or mixture, and the mixture was then pyrolyzed (900°C for 1 hr.) and finely ground before further processing. The cobalt porphyrin is not a cationic platinum catalyst complex, nor a reduced form thereof. Moreover, cobalt is not platinum. Thus, Tosco et al. does not teach claim 29, or the claims dependent on claim 29.

Accordingly, this rejection should be withdrawn.

The applicant notes that previously presented claims 19, 3, 4, 7, 8, 10, 22, 24 and 25, which are included in new claims 29-37, respectively, were not included under this rejection

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based on Tosco et al. Therefore, new independent claim 29, and its dependent claims 30-37, also should be considered patentably distinguishable from Tosco et al. for this reason. New claims 38 and 39 recite further features that are not taught or suggested by Tosco et al., and also are patentable thereover.

**Rejection of Claim 17 under 35 U.S.C. §102(b) -- Swathirajan et al.**

At page 6 of the Office Action, the Examiner rejects claim 17 under 35 U.S.C. §102(b) as being anticipated by Swathirajan et al. (U.S. Patent No. 5,316,871).

In the rejection statement, the Examiner also appears to qualify the application of this grounds of rejection as being applicable to "at least" claim 17. However, no claims are separately discussed or otherwise identified under this rejection other than claim 17. The Examiner essentially relies on Swathirajan et al. in the same manner as in previous Office Actions. There is an additional reference to a fuel cell at col. 1, lines 33-36 in the Background of the Invention section of Swathirajan et al. The Examiner asserts that the carbon groups contain carboxylic groups on the carbon surface and refers to col. 12, lines 60-65. This rejection is respectfully traversed.

The applicant submits that this rejection is not applicable to new claim 29 for at least the same reasons previously made of record by the applicant relative to claim 17. As previously explained in the record by the applicant, carboxylic groups are not proton-conducting groups, and the Examiner's reliance on the passage at col. 12, lines 60-65 of Swathirajan et al. fails for this same technical reason. Carboxylic groups are not taught or illustrated as an organic group in the present specification. Instead, significantly dissimilar organic groups from -COOH alone are illustrated in the present application (*e.g.*, see pages 12-15). The present application refers to



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-COOH and other ionizable functional groups *as used* in the same moiety with organic groups of aromatic or naphthyl groups at page 12, lines 19 to page 13, line 15. Clearly, those organic groups are quite different from -COOH *per se* mentioned by Swathirajan et al. There is no sufficient factual basis for inferring that a -COOH group alone falls within the scope of a proton-conducting organic group feature such as recited in present claim 29.

Accordingly, this rejection should be withdrawn.

The applicant notes that previously presented claims 19, 3, 4, 7, 8, 10, 22, 24 and 25, which are included in new claims 29-37, respectively, were not included under this rejection based on Swathirajan et al. Therefore, new independent claim 29, and its dependent claims 30-37, also should be considered patentably distinguishable from Swathirajan et al. for this reason. New claims 38 and 39 recite further features that are not taught or suggested by Swathirajan et al., and also are patentable thereover.

**Rejection of Claims 1, 8, 10, and 20 under 35 U.S.C. §103(a) – Tosco et al. in view Watakabe et al.**

At page 12 of the Office Action, the Examiner rejects claims 1, 8, 10 and 20 under 35 U.S.C. §103(a) as being unpatentable over Tosco et al. as applied to claim 17, and further in view of Watakabe et al. The Examiner's reasoning for this rejection appears to essentially rely on the same previously made comments with regard to these references. This rejection is respectfully traversed.

As previously explained by applicant in the record, there is a reference in Watakabe et al. to a platinum-supporting carbon to form a gas diffusion electrode layer having a thickness of 10 microns, but Watakabe et al. does not use a modified carbon product as part of the active layer.

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Also, Watakabe et al. does not compensate for the above-identified differences between claim 29 and Tosco et al., and, therefore, the combination of these references can not meet all the claimed recitations of the present claims.

Accordingly, this rejection should be withdrawn.

The applicant notes that previously presented claims 19, 3, 4, 7, 22, 24 and 25, which are included in new claims 29, 30, 31, 32, 35, 36 and 37, respectively, were not included under this rejection based on Tosco et al. and Watakabe et al. Therefore, new independent claim 29, and its dependent claims 30-32 and 35-37, also should be considered patentably distinguishable from Tosco et al. and Watakabe et al. for this reason. New claims 38 and 39 recite further features that are not taught or suggested by Tosco et al. and Watakabe et al., and also are patentable thereover.

**Rejection of Claims 1 and 20 under 35 U.S.C. §103(a) – Swathirajan et al. in view Watakabe et al.**

At page 14 of the Office Action, the Examiner rejects claims 1 and 20 under 35 U.S.C. §103(a) as being unpatentable over Swathirajan et al. as applied to claim 17 above, and further in view of Watakabe et al. The Examiner's reasoning for this rejection essentially relies on the previous comments made with regard to these references. This rejection is respectfully traversed.

As noted, there is a reference to a platinum-supporting carbon to form a gas diffusion electrode layer having a thickness of 10 microns, but Watakabe et al. does not use a modified carbon product as part of the active layer. In any event, Watakabe et al. does not compensate for the above-identified differences between claim 29 and Swathirajan et al., and, therefore, the combination of these references can not meet all the claimed recitations of the present claims.

Accordingly, this rejection should be withdrawn.

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The applicant notes that previously presented claims 19, 3, 4, 7, 8, 10, 22, 24 and 25, which are included in new claims 29, 30, 31, 32, 33, 34, 35, 36 and 37, respectively, were not included under this rejection based on Swathirajan et al. and Watakabe et al. Therefore, new independent claim 29, and its dependent claims 30-37, also should be considered patentably distinguishable from Swathirajan et al. and Watakabe et al. for this reason. New claims 38 and 39 recite further features that are not taught or suggested by Swathirajan et al. and Watakabe et al., and also are patentable thereover.

### CONCLUSION

In view of the foregoing remarks, the applicant respectfully requests the reconsideration of this application and the timely allowance of the pending claims.

If there are any fees due in connection with the filing of this response, please charge the fees to Deposit Account No. 03-0060. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such extension is requested and should also be charged to said Deposit Account.

Respectfully submitted,

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